

25 years
of
botany

HISTORY OF BOTANY

1947–1972

WITH A BIBLIOGRAPHIC APPENDIX¹

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Today we have heard a series of papers on the developments that have transpired in the past 25 years in the several major disciplines of botany. The recounting of events, highlights, and the work of individuals that have brought their respective fields to their present state of knowledge is in fact the basic materials for the history of botany as a distinct discipline. In a broader context, the endeavor of science, by its nature, is progressive and directive; building on what came before, discarding what is unsound in the light of new information, and finding new approaches or new theories of explanation. History, on the other hand, is reportive and analytical; the good and the bad, the successful and the unsuccessful, as well as the progressive and the retrogressive all deserve consideration. The historian of science faces a dilemma. Should he make value judgments about the course of history saying this line was “good” or that one “bad” or “retrogressive”? Too often it has been shown that the bias of a particular time changes, and what was thought “good” at one time is thought later or by someone else to not be as “good.”

Further complications of interpretation arise in the breadth of approach made to the study of the history of science or to a particular science. For example, the history of botany, or mycology, or radiation botany could be considered by its students as only consisting of the events and concepts within that science—what is termed internal history. On the other hand, the student might consider the events in the science and its concepts in the broader stage of human activities as they relate directly or indirectly to the history of his science—what is termed external history. How should the historian of botany interpret the changes that have taken place in his science? As a series of sudden overthrows of established theory, procedure, and persons by the new challengers; as a series of revolutions as proposed by Thomas Kuhn (1970)? Or should he interpret the historical

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framework as a more gradual evolutionary series of changes in conceptualization, as is the more traditional opinion? These are the kinds of questions that concern the historian of science today. Many of these concerns have emerged during the past 25 years, during which time the history of science as a discipline has grown and become a viable independent field of study in this country. As bio-historians and botanists we should be prepared to be examined by historians and philosophers of science, to be asked difficult questions about why we approach our studies in the manner we do, and to learn to appreciate the value of critical external as well as self-examination. Our work can be interesting and exciting, and at the same time it can be scholarly and enlightening.

HISTORY OF BOTANY AS A DISCIPLINE

The history of botany as a discipline is now stronger, more active, and better recognized than at any time in the past. Our recounting of key events, developments, and publications in this field should provide sufficient evidence for such a belief. Since the founding of our country, most of the papers and books on the history of botany have been concerned with the history of the oldest of the plant science disciplines, namely, taxonomy and plant exploration. Much of this history has been written by taxonomists themselves. Within the past 50 years, and certainly within the past 25 years, the history of botany has broadened to include the histories of all of the botanical disciplines and more and more is being written by botanists of these other disciplines; the majority, however, are still being written by taxonomists. Historians of science and others have also begun writing botanical history. As this essay unfolds the present-day prominent writers and their fields should become apparent. If our paper sounds biased toward a history of taxonomic botany, it will be understood, not only because of the large amount of botanical history literature from that group, but also because of our strong ties to that discipline. Our approach provides some reasons why we should be studying the history of botany and gives some of the highlights that have come about in the field of botanical history in North America in this quarter century. Not being able to mention every important event or to cite every paper published, we have appended an extensive selective bibliography with the anticipation that it may be a useful reference tool for those who wish to explore the disciplines of the history of science, biology, and especially botany in either a general or specific manner. The arrangement of the bibliography has presented its problems, especially in that some categories are quite arbitrary and considerable overlap exists from one category to another. However, we believe that this arrangement will prove useful for teachers.

Why should botany students and teachers, or for that matter any botanists, be concerned with the history of their science? Two important reasons suggest themselves: insight and understanding. Insight is the quality brought into the methods of explanation and discovery that comes only from the perspective of history. By looking to the past, one can develop a better sense of the present. For example, the very detailed historical analysis of cellular respiration written by Keilin (1966), one of the major workers on that problem, provides an exciting perspective for understanding the present and suggests ways that science develops.

His approach makes valuable contributions to the teacher who must explain modern cellular respiration. The second reason, understanding, is particularly relevant to those of us who teach and learn. If one needs to understand some aspect of botany, one way, a way we think is useful, is to trace the history of the understanding of that subject. It will start at the beginning in a situation where the facts are put together and a hypothesis suggested. Upon this simple base, new experiments and observations are made, and step by step the superstructure is built. False starts, dead ends, and bursts of understanding occur, but all of these add to the excitement of understanding how the current solution to the problem came into being. This "case history" method was used successfully by Conant (1957). His approach still has much to recommend today. Science students are frequently surprised at the difficulties that appear along the way to current understanding as much as they are with the bursts of genius. It is valuable for them to realize both of these aspects. People and how they think are just interesting to other people. Thus, history can inject humanity into beginning botany that can be obtained in no other way. For example, in two recent beginning botany texts, persons are introduced as individuals (Cronquist, 1971; Jensen & Salisbury, 1972). The historians and philosophers of science add another reason for studying the history of botany. Their approach is to attempt to understand the way concepts have developed in relation to the basic philosophical framework of the science of botany and its broader relationships with the biological and physical sciences. Thus, the history of botany has an intrinsic interest all its own. Perhaps more botanists should develop this approach and interest!

HISTORIES OF VARIOUS DISCIPLINES

Those wishing to approach the study of botany from the historical perspective or anyone wanting to learn what has occurred in the history of botany must naturally become aware of the events and work that have come forth. For example, no fewer than 15 papers on the history of botany of the United States have appeared between 1814 and 1947 (Ewan, 1969: 153). In the past 25 years, since 1947, or beginning the last half of the twentieth century, summaries of the botanical history in the United States or in North America are much more plentiful than previously and are a part of the information explosion that has affected all fields of learning. Many papers, summaries, and treatises have been written as individual efforts. Other accounts have come about because of a special meeting, committee, or symposium that was held for a special occasion, such as the one today. In fact had it not been for symposia of the kind we are having today, some botanical disciplines, such as anatomy, morphology, ecology, or paleobotany would have little or virtually no written history.

Three major events in the past 25 years have provided the stimulus for bringing together in book form a series of papers on the history of botany in the United States. First, a series of essays published in 1955 were prepared as part of the recognition of the Centennial of the California Academy of Sciences (Kessel, 1955). The central theme of that volume was the historical treatment of the systematics of living organisms and covered the development of various

areas of cryptogamic botany, the systematics of gymnosperms and angiosperms, and plant geography.

Second, and of particular interest to this audience, was the celebration of the Golden Jubilee of the Botanical Society of America meeting with the AIBS in 1956 at the University of Connecticut, Storrs. Six invited papers were presented on the progress and achievements of the past 50 years in phycology, mycology, taxonomy, paleobotany, morphology, and physiology. These presentations and a series of special invitational papers of broad and general interest were published in volumes 43 and 44 of the *American Journal of Botany* and 40 of these papers were reprinted constituting a book, *Fifty Years of Botany* (Steere, 1958). This collection of papers was designed to enable intelligent nonbotanists to understand and to appreciate what botany is and what botanists were doing. The early history of the Botanical Society of America was also reviewed at that time by Tippo (1956), and a special feature was the awarding of Certificates of Merit to fifty persons who were judged to have made outstanding contributions in botanical science (Meyer, 1956). Since then, additional Certificates of Merit to outstanding botanists are awarded each year by the Botanical Society.

Third, and in the tradition of former International Botanical Congresses, it was proposed by the Historical Section of the Botanical Society of America, in particular by Professor Jerry Stannard, then secretary of the section, that a *Short History of Botany in the United States* be prepared for the Eleventh Congress meeting at the University of Washington, Seattle, in 1969. This book was prepared under the editorship of Professor Joseph Ewan (1969). Thirteen areas of special interest or disciplines were treated, with information on important developments and trends, principal investigators, and significant dates. Most of the histories extended to the present, and therefore now provide good backgrounds for current research and teaching. An additional five disciplines—genetics, cytology, ecology, horticulture, and medical botany—were treated in this volume that were not included in previously mentioned ones. The addition of these disciplines is a reflection that the scope of the history of botany was expanding. It is of further interest, and perhaps of significance to point out, that in this symposium today we have for the first time had a special paper devoted to the discipline of the history of botany. This event certainly reflects the growing interest in this field, the role of a few key individuals in this country who are interested in this field of study, and the role that the Botanical Society of America has played in fostering the history of botany in the United States.

A brief examination of the number of histories of the various disciplines of botany that have been considered at special symposia, or the collected works resulting from them, and an examination of titles in our representative bibliography reveals that, as mentioned earlier, the history of taxonomy and plant exploration has led the way. By the nature of their work, always building on and revising past work, taxonomists are concerned with collections of plants and their data, biographies of the individuals who explored and obtained plants, dates of collections and publications, travel narratives, diaries, letters, and other associated materials. Lincoln Constance, George H. M. Lawrence, and Reed Rollins have given much to the understanding of the history and conceptual

framework of taxonomy as a discipline. Professor Joseph Ewan, as a contributor to the history of taxonomy, has combined biography and exploration in his many works. A masterpiece of this quarter century in the history of botanical exploration is Susan Delano McKelvey's *Botanical Exploration of the Trans-Mississippi West* (1955). In this one work can be traced in meticulous detail the history of trained botanists and others in the western half of the United States from 1790 to 1850. Botanical exploration, biography, and evaluations of historically important plant collections have been subjects for scholarship of others such as Samuel Wood Geiser, Jeannette E. Graustein, Rogers McVaugh, Elmer D. Merrill, Harold William Rickett, Andrew Denny Rodgers, III, Ronald L. Stuckey, and John H. Thomas.

Genetics, too, has been building a sizable amount of literature on its history within the past 25 years. Although perhaps some would argue that it is not a part of our fraternity—it is not represented in this symposium, and many universities have separate departments of genetics—we believe it is a subject for the historian of botany. Perhaps fostered by the histories of plant hybridization by Roberts (1929, reprinted 1965) and Zirkle (1935), information in the field of the history of genetics has increased significantly. A further highlight was the celebration of the Golden Jubilee of Genetics, in honor of the fiftieth anniversary of the rediscovery of Mendel's work. At this meeting, held at The Ohio State University, Columbus, in 1950, under the sponsorship of the AIBS, 26 papers surveying the progress of genetics and exemplifying the status of problems of that day were presented. These papers were published as *Genetics in the 20th Century* under the editorship of L. C. Dunn (1951). The Gregor Mendel Symposium in Brno, Czechoslovakia, in 1965, added further stimulus to the writing of the history of genetics (Milan, 1966; Stern & Sherwood, 1966). The history of genetics, like that of taxonomy, has largely been written by the geneticists themselves; particularly noteworthy are the many contributions of the botanist Conway Zirkle.

On the other hand, some of the more specialized fields, such as anatomy, morphology, paleobotany, phytogeography, and certain areas of cryptogamic botany, have had little written of their history. Most of what has been written has been as a response to the three special events discussed earlier. However, it is surprising that little has been written on the history of ecology, a discipline much in the forefront of botany today, as well as in the forefront of countless other either related or nonrelated disciplines. Ecology is as old as some of the other basic botanical disciplines. Perhaps this paucity of papers reflects upon the difficulty of analyzing this multifaceted discipline.

ROLE OF THE BOTANICAL SOCIETY OF AMERICA

As alluded to above, the Botanical Society of America has played some role in fostering the history of botany as a discipline by creating an Historical Section. At the business meeting of 26 August 1963, a committee was formed to investigate the possibility and advisability of such a section, and the following year on 23 August at the University of Colorado, Boulder, the tenth section, the Historical Section, was created (Stannard, 1965). The stated purposes of this section were

the promotion of general interest and encouragement of research and dissemination of knowledge in the history of botany, the establishment of closer relations between botanists and historians of science and medicine engaged in research in or the teaching of the history of botany, and the arrangement of suitable programs dealing with the history of botany in connection with annual meetings of the Botanical Society of America. The first session of contributed papers was held at the University of Illinois, Urbana, in 1965, and since then the Historical Section has held a session for contributed papers at each yearly meeting of the Society. Some years papers have been few and attendance low, but enthusiasm has been high, and what we need are more people interested in botanical history presenting papers and contributing. Membership in this section is now at 225 individuals.

In addition to the Historical Section, the archives of the Botanical Society of America, through 1954, were deposited in the History of Science collection at the University of Texas in 1964 (Leech, 1966). These valuable records and other botanical records there provide one source of primary materials for botanists and others seeking historical information. The Botanical Society of America is also providing botanical historians important information that is published in the *Plant Science Bulletin*. Although a committee was appointed in 1925 to consider the inauguration of a leaflet of botanical notes and news of benefit to teachers, amateurs, and others, this suggestion remained fallow for 30 years before coming to fruition in January 1955, when the first issue of the *Plant Science Bulletin* appeared with Harry J. Fuller as editor. Although at first not particularly interested in special events of botanical history, biographies of noted botanists, or book reviews (Fuller, 1955), the *Bulletin* has in recent years been publishing this type of information.

BIOGRAPHICAL APPROACH

Biographies and bibliographies of individual botanists have long been a major form of recording botanical history. These biographies and bibliographies appear in books or as small articles in botanical or other journals. In the 1940's we saw the results of what one man, neither a trained historian nor botanist, did for the history of botany. Mr. Andrew Denny Rodgers, III, of Columbus, Ohio, and a lawyer by profession, left the practice and devoted his full time to the writing of biographies of botanists. Seven biographies appeared from his pen from 1940 until 1952 (Rodgers, 1940, 1942, 1944*a*, *b*, 1949, 1951, 1952). His books are unique in that not only does each volume focus on one person (three in one book), but each also develops the history of that facet of botany for which the individual was a leader. Since 1965 all of Mr. Rodgers' books, except two, have been issued in facsimile editions by the Hafner Publishing Company. Presenting these life stories of American botanists has also provided a single thread of the development of botanical science in the United States. As a result of Mr. Rodgers' writings more is known about American botanists than about any other group of American scientists. His books are readable, scholarly, and authentic, and they have become "classics" for the significant documentation and evaluation of American botanical history. In the course of his research, Mr.

Rodgers discovered and preserved important collections of manuscript source materials which might otherwise have been lost. In recognition of his accomplishments and their value to botany in the United States, the Botanical Society of America, at its Golden Jubilee celebration in 1965, awarded him a Certificate of Merit, one of only 50 awarded to living botanists. Mr. Rodgers' pioneering research has laid the foundation for disciplined, scholarly study of the history of American botany.

Research has in the past quarter century seen the continued production of full-length book biographies, analyzing the person and his accomplishments in the context of the period in which he worked. Our bibliography lists 22 additional titles, most of which have been produced since Mr. Rodgers' last book in 1952 (see references in Appendix, Category VII, B). A few examples are: (1) The historian Dupree's life of Asa Gray, the leading American botanist of the nineteenth century, which deals not only with botanical history and exploration, but also with the history of science, American intellectual and social history, philosophy and its relation to science, theology, and the history of higher education. (2) Graustein's life of Thomas Nuttall, which brings him into focus as a thorough scholar and pioneer naturalist of scientific explorations into the American wilderness. (3) Ewans' John Banister, which presents a collection of Banister's own works that documents his place in the growth and knowledge of the natural history of the Atlantic seaboard for the seventeenth and eighteenth centuries. And (4) Sutton's life of Charles Sprague Sargent, which also concerns the development of the Arnold Arboretum and the American National Forests. University presses have usually provided the publication outlet for these biographies.

Countless numbers of biographical sketches (with or without bibliographies) or obituaries of contemporary botanists appear in many botanical journals. Twenty of these journals are mentioned in our bibliography (see references in Appendix, Category V). Biographical information must also be sought in state academy journals, state and local historical society journals, university bulletins, and special memorial papers. Much of this kind of information, especially that in journals other than botanical ones, is lost to botanists because no reasonably complete index currently lists these kinds of papers.

OTHER APPROACHES

Within the past quarter century we have seen the assembling of chronologies for botanists, for certain disciplines, and for periods in the history of botany. In this approach, according to Ewan (1970a), relationships emerge from the juxtaposition of the events that are brought together. These events, from the lives of individuals and their discoveries or accomplishments, allow us to outline botanical history and to think horizontally in time instead of the usual manner of thinking vertically. This technique has been developed to its fullest extent in this country by Joseph Ewan. His broadest botanical chronology in the *Short History of Botany in the United States* (Ewan, 1969: 1) spans time from ca. 300 B. C. to 1968 and gives a plethora of details that characterizes the trends and growth from all the plant sciences in the United States. Otherwise, Ewan's chronologies have been prepared for early American botanists—William Baldwin,

John Bartram, William Bartram, John Banister, Stephen Elliott, John Lyon, Humphrey Marshall, and Thomas Nuttall. Other examples of chronologies are those for the field of plant pathology (Parris, 1968), and the recent bibliographies of botany for the states of Louisiana (Ewan, 1967) and for New Jersey (Fairbrothers, 1964, 1966).

The writing of the history of botany for each state has long been a standard approach. State botanical histories have usually been published in state academy journals, university bulletins, or as a chapter in a state or regional flora. An excellent example of the latter is the history of botanical explorations in the intermountain region in the recent *Intermountain Flora* by James Reveal (1972). Much of this type of historical information, however, is buried or even lost in the melieu of scientific, botanical, and popular literature. No bibliography has yet been compiled listing the titles of the histories of botany for each state. Such a bibliography would be a valuable working tool for future botanical historians. Within the past 25 years we have noted no fewer than 15 histories or compilations of biographical sketches of botanists and plant collectors for various states or regions (see references in Appendix, Categories V, VII). One book, *History of Botany in West Virginia* by Weldon Boone (1965a), must be singled out, for it attempts to integrate all aspects of the development of botany within the state—the various disciplines, botanical contributions of approximately 500 individuals in the form of their biographies and bibliographies, and the development of botany in the various universities. Written in a simple thorough style, Boone's is a scholarly work that may well serve as a good model of the history of botany in a state, which can be used by both the amateur and professional.

Probably no single botanist has contributed more to botanical history in the past 25 years than Professor Joseph Ewan of Tulane University, New Orleans. Beginning his biographical and historical investigations in 1933 as a research assistant under the botanist, W. L. Jepson, at the University of California, Ewan has authored over 110 short articles, reviews, and book-length monographs in the history of botany (Ewan, 1970b). His researches integrate botany and history, span all of time, and cross lines of endeavors—biographies, plant exploration, bibliographies, chronologies, and histories in several disciplines—taxonomy, phytogeography, and horticulture. Written in authoritative, scholarly, and interesting style, no historian of botany should be without access to his works, and we expect many more essays from his prolific pen.

SOURCES FOR INFORMATION

Within the past 25 years, several new journals (10 are listed in Table 1) have been established which are sufficiently interested in historical matters to publish biographical sketches, articles on botanical exploration, or evaluations of botanical history. Among these, mostly taxonomic journals, are *The Michigan Botanist*, *Sida*, *Taxon*, and *Huntia*. The *Journal of the History of Biology*, founded in 1968, contains articles mostly written by historians of science and is concerned with the emergence of ideas and the penetrating and critical analyses of changing concepts and altered methods of experimentation and observation. This analytical approach has sound scholarship and is to be commended; however, to date

TABLE 1. Scientific journals that have been established within the past 25 years that contain papers or information on American botanical history—evaluations, perspectives, biographical sketches, exploration, book reviews, and bibliographies of individuals and/or disciplines.

Taxon	1951
International Association for Plant Taxonomy, Utrecht, Netherlands. J. Lanjouw, original editor; now edited by Frans A. Stafleu.	
Regnum Vegetabile: A Series of Publications for the use of Plant Taxonomists	1953
International Association for Plant Taxonomy, Utrecht, Netherlands. J. Lanjouw, original editor; now edited by Frans A. Stafleu.	
Plant Science Bulletin	1955
Botanical Society of America, Tampa, Florida. Harry J. Fuller, original editor; now edited by Robert W. Long.	
British Journal for the History of Science	1962
The British Society for the History of Science, 393 Cowby Road, Oxford. M. P. Crosland, editor.	
History of Science: An Annual Review of Literature, Research, and Teaching	1962
W. Heffer & Sons Ltd., Cambridge, England. A. D. Crombie and M. A. Hoskin, editors.	
The Michigan Botanist	1962
The Michigan Botanical Club, Ann Arbor, Michigan. Edward G. Voss, editor.	
Sida: Contributions to Botany	1962
Privately published, Dallas, Texas. The late Lloyd Shinnars founder and editor; now edited by William F. Mahler and John T. Thieret.	
Huntia: A Yearbook of Botanical and Horticultural Bibliography	1964
The Hunt Botanical Library and Carnegie Institute of Technology [now called Hunt Institute for Botanical Documentation], Carnegie-Mellon University, Pittsburgh, Pennsylvania. George H. M. Lawrence, original editor.	
Bibliography of the History of Medicine	1966
National Library of Medicine, Bethesda, Maryland.	
The Journal of the History of Biology	1968
Belknap Press of Harvard University, Cambridge, Massachusetts. Everett Mendelsohn, editor.	

no papers pertaining strictly to botanical subjects have been reported in this journal. The *Journal of the Society for the Bibliography of Natural History*, founded in 1936 and published in England, serves a valuable function in the history of biology, but no journal of its scope is published in the United States.

Several journals that were publishing articles on botanical history in the United States have been discontinued shortly before or within the past 25 years. Among those were *Torreya* (as a separate journal in 1945), *Asa Gray Bulletin* in 1961 (replaced essentially by *The Michigan Botanist*), and the privately published journals, the *American Botanist* in 1947 and *Leaflets of Western Botany* in 1966. *Chronica Botanica*, founded in 1935 and edited by Frans Verdoorn through 1954, was an international journal devoted to botanists and their activities. Begun in the Netherlands, Verdoorn carried on his historical studies and editorial

work in Waltham, Massachusetts, from 1937 until 1957, when he moved back to the Netherlands.

If twentieth century botanical history is to be as well recorded and documented as botanical history has been in past centuries, we must save letters, diaries, photographs, field notebooks, and laboratory records, and properly house them in institutions designed and devoted to the keeping of such records. Biographies, bibliographies, chronologies, and indexes will need to be prepared and published in order that the analytical historians may assimilate and correlate the facts and events that made twentieth century botany. It seems to us that a great need does exist for a journal devoted solely to the biography and bibliography of American botanical history. Such a journal should be most welcomed by taxonomists, but those in all other fields of botanical science would have a place to record their histories. *Huntia* published on a regular basis could help fulfill this role.

Elmer D. Merrill's imaginative planning in 1946 for the facsimile lithoprint reproductions of certain rare, much sought for, and very expensive or out of print botanical publications began an industry which has burgeoned since then, and especially in the past decade (Ewan, 1970a). Merrill saw to the reprinting of several early extremely rare classic American floras, such as Gronovius' *Flora Virginica*, Walter's *Flora Caroliniana*, and several of Rafinesque's rare books. The reprinting of works dealing with botanical history has been no exception. For example, we have already mentioned in passing the reprinting of five of Mr. Rodgers' books. The Hafner Publishing Company in New York City has probably led in the publishing of facsimile reprint editions. The *Classica Botanica Americana* series is one of their most comprehensive reprint endeavors. Now projected as seven volumes with two supplements, these are reprints of American botanical classics, mostly floras, selected for their critical reference value and historical importance (see references in Appendix, Category VI). Edited by Professor Ewan, each original is prefaced with biographical and bibliographical commentary that orients and assists the user in the significance of the work and in understanding unfamiliar procedures in its composition (Lubrecht, 1967). Only volumes two and three remain to be published of the original projected series.

A few other significant highlights in the past 25 years must be mentioned to help round out the story. On 10 October 1961, the Carnegie Institute of Technology formally opened to scholars and the public the Rachel McMasters Miller Hunt Botanical Library in Pittsburgh, Pennsylvania. Financed by the Hunt Foundation, this library set out on a five-fold research program in the history of botany: (1) completion of the *Catalogue of Botanical Books in the Library of Rachel McMasters Miller Hunt* (Quinby, 1958; Stevenson, 1961), which has already been completed in two volumes covering 764 titles and is fully described with biographical and bibliographical aids for the books dated through 1800, although many more books and special collections (e.g. Adanson and Linnaeus) have been added, (2) activation of the Hunt Facsimile Series (several of which have been published), (3) establishment of the Hunt Monograph Series, (4) activation of a project whose objective is the production of a comprehensive and

analytical catalogue of all of the works in systematic botany and allied subjects published during the period 1735–1850, the *Bibliographia Huntiana*, and (5) the publication of a yearbook, *Huntia*, to serve as a medium for studies in the area of botanical and horticultural bibliography (Lawrence, 1962, 1964). Two volumes of *Huntia* have appeared and more are anticipated. Noteworthy of mention is *B-P-H* (*Botanico-Periodicum-Huntianum*) (Lawrence, Bucheim, Daniels & Dolezal, 1968), a compendium of information listing abbreviations for citations on all periodical publications that regularly contain (or have contained) articles dealing with the plant sciences and botanical literature and with the persons who have contributed to botany and its literature. The Hunt Library's research program has been one of essentially making available valuable "tools" for the historian of botany and the preservation of records—such as manuscripts, letters, illustrations used in books, and photographs of botanists. The research at the Hunt Library, begun under the directorship of George H. M. Lawrence, well known for his work in taxonomy and horticulture, is now, after 10 years, under the recent new leadership of George S. Daniels, and the Library has changed its name to the Hunt Institute for Botanical Documentation of Carnegie-Mellon University. Other earlier established libraries having significant amounts of botanical materials continue to serve the historian of botany. Some of these institutions are now organized into the Council on Botanical and Horticultural Libraries (see C B H L Newsletter, numbers 1 and 2, 1972).

A few other "tools" bear mention. For reference to biographical information on botanists, no one should be without access to the 3-volume, *Biographical Notes Upon Botanists* (Barnhart, 1965). These data, originally accumulated on over 44,000 cards by Dr. John Hendley Barnhart, bibliographer of the New York Botanical Garden, were made available by G. K. Hall in 1965. This index provides references to information about botanists, mostly taxonomists and horticulturalists, from all over the world from the earliest times to the late 1940's. Other reference "tools" made available in recent years that are valuable for the study of the history of botany are the fifteen folio volumes of the *U. S. D. A. Botany Subject Catalog* (1958). This original card file of 315,000 references was amassed by Alice C. Atwood and Marjorie Warner and their successors over a period of fifty years in Washington, D.C. Leading bio-historians and editors have judged this work as the best single "tool" in this country for searching botanical references through the year 1952 (Ewan, 1965). The reprinting of Max Meisel's (1924–1929) *Bibliography of American Natural History* in 1967, Ida Langman's (1964) *Selected Guide to the Literature of the Flowering Plants of Mexico*, and Frans Stafleu's (1967) *Taxonomic Literature: A Selective Guide to Botanical Publications with Dates, Commentaries and Types* should not go unnoticed.

In the past 25 years we have seen an amazing proliferation of materials for studying the history of botany. Not only the papers, journals, or books of which we have spoken, but also important is the ease of reproducing by photocopy or microform data from published papers, manuscripts, letters, or herbarium labels that we did not have 25 years ago. The use of the computer in storing and retrieving information should develop into an asset for the study of the history

of botany. Today, facsimiles and reprints of classical works or collections of reprints of important papers are available, often in reasonably priced paperback editions. Many of these editions contain valuable interpretative introductions and supplements. Another development that is no less striking is the appearance of inexpensive methods of fine color reproduction which makes possible better graphic presentation of original drawings of the past, such as those of Ewan (1968) on William Bartram. The "tools" and literature available to the historian of botany today are indeed much greater than those 25 years ago.

THE FUTURE

What do we need or will we need for the future? As Professor Ewan (1970a) has noted, we have the pressing need to search for records, save these records before they are lost, compile information retrieval aids, and write interpretive histories. Biographies of botanists will continue to be written. Hopefully, more analytical histories of the disciplines and trends in the development of ideas and concepts will be prepared. We will need journals that will publish these papers. As has been alluded to above, we will need more "tools," such as indexes to biographies, textbooks, book reviews, chronologies, manuscripts, bibliographies, and certain kinds of specific botanical histories, *e.g.* those of botany in various states, botanical societies, herbaria, and botanical gardens. Many fruitful ideas needing attention and study in the history of botany have already been outlined by Stannard (1966). The future is indeed bright with prospects for a bountiful harvest to those who will plow the field of the history of botany.

BIBLIOGRAPHIC APPENDIX

An asterisk appears with those references that are cited in the text, most of which are listed in categories III and IX. The complete citation for those references that conclude with "see Ewan, 1969"; "see Kessel, 1955"; or "see Steere, 1958," are found in category III.

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NOTA BENE

This bibliographic appendix has been prepared with those who are beginning to use historical approaches in their teaching and/or research in mind. Thus, some very selected works by European authors or about mainly European history that peripherally relate to American botany are included (*e.g.* Sarton, 1952, 1957, 1959; Taton, 1963–1966; Sachs, 1890). The annual "Critical bibliography of the history of science and its cultural influences," published as part of *Isis* by The History of Science Society, should be consulted for further in-depth study of particular topics or periods. The in-progress *Dictionary of Scientific Biography* (Gillispie, 1970–) contains more original analytical and original material about the botanists covered than the title might indicate.